

**Syllabus
For The Trade of**

TURNER

**Under
Craftsmen Training Scheme (CTS)
&
Apprenticeship Training Scheme (ATS)**

Revised in – 2005

**Government of India
Ministry of Labour & Employment (DGE&T)
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN Block, sector – V, Salt Lake,
Kolkata – 700 091**

**LIST OF MEMBERS ATTENDED THE TRADE COMMITTEE
MEETING FOR THE TRADE OF "TURNER"**

Sl. No.	Name and Designation	Organization	
1.	M.S. Lingiah, Director	CSTARI, Kolkata	Chairman
2.	Ramesh. G. Nandi, Asst. Manager	TATA Motor, Pimpri, Pune	Member
3.	Debashis Chatterjee, Manager, Tech. Education.	TATA STEEL, Jamshedpur	Member
4.	Dipankar Bose, Asst. Professor	NITTTR, Salt Lake	Member
5.	T.S.Ramanathan, Dy. Manager (HRD)	CESC Ltd. HRD Dept.	Member..
6.	Sukumar Bose, W.S.Instructor	G.T.T.I., Kolkata	Member.
7.	Titas Nandi, HOD- Training	CTTC, Kolkata	Member.
8.	Dilip Kr. Dubey, Asst, Director	D.I.T., West Bengal	Member.
9.	T. Mukhopadhyay, Dy. Director	CSTARI, Kolkata	Member.
10.	S.Kumar, Dy. Director.	CSTARI, Kolkata	Member
11.	V.Babu, Asst. Director	CSTARI, Kolkata	Member.
12.	A..Chakraborty, Asst.Director	CSTARI, Kolkata	Member.

GENERAL INFORMATION

- 1 Name of the Trade: **TURNER**
- 2 N. C. O. code No: **: 835.55**
- 3 Entry Qualification: **Passed class 10th Exam. Under
10+2 system of education or its Equivalent.**
- 4 Duration of Craftsman Training: **Two years.**
- 5 Duration of Apprenticeship Training: **3 years including Basic Training of two years**
- 6 Rebate to Ex-ITI Trainees: **a) 2 years for Ex-ITI Turner**
- 7 Ratio of Apprentices to Workers: **: 1: 5.**

NOTE FOR APPRENTICESHIP TRAINING

1. The Practical Training Programme of Apprentices under ATS (Apprenticeship Training Scheme) should be as per the facilities available in the Establishment / Industry.
2. At the end of shop floor training, an apprentice shall appear for a final examination to be conducted at establishment level based on the actual shop floor training received by the apprentices. This examination shall comprise of assessment of work diaries maintained by the apprentices and Viva Voice to be conducted by an external examiner (other than an official directly responsible for shop floor training).

SYLLABUS FOR THE TRADE OF TURNER UNDER CRAFTSMEN TRAINING SCHEME

PERIOD OF TRAINING : 2 YEARS

Week No	Practical	Theory	Engineering Drawing	Workshop Calculation & Science
1	Introduction Training Familiarization with the Institute. Importance of trade training. Machinery used in the trade. Types of work done by trainees in the trade. Introduction of safety rules in the shop floor and to the fire fighting equipment etc. Introduction of First Aid. Operation of Electrical Mains.	Importance of safety and precautions to be oversexed in the section as well as in the institute, causes of accident and its remedies. Importance of the trade in the industrial development of the country. Subjects to be taught and standard of proficiency to be attained. Awareness of recreational, medical leave and other facilities- necessary guidance to be provided to become familiar with the working of the Institute including stores procedures.		
2	Practice on hammering, marking out, chipping, chisel grinding	Measurement, line standard and end standard, steel rule-different types, graduation and limitation. Hammer and chisel-materials, types and uses. Prick punch and scriber.	Engg. Drawing, types and their importance	Introduction of properties and uses of C.I. & W.I.
3	Filing practice on plain surfaces, right angle by filing. Use of calipers and scale measurement.	Vice – types and uses, Files- different types of uses, cut, grade, shape, materials etc. Try square- different types, parts, material	Types of lines, their meaning and application as per BIS 696	Arithmetic : Fundamental operation, addition, subtraction, multiplication and division of decimals

4	Filing at right angle, marking & hacks awing.	used etc. Calipers-types and uses (firm joint). Vee - block, scribing block, straight edge and its uses. Hacksaw-their types & uses.	Simple conventional symbols for material and parts as per BIS: 696.	Properties and uses of plain carbon steel and alloy steel.
5	Marking operation on flat & round job. Drilling operation.	Center punch- materials, construction & material uses. Drill machine-different parts. Hacksaw blades- sizes , different Parts. Hacksaw blades-sizes, different pitch for different materials. Nomenclature of drill.	Uses and application of Drawing instruments in the geometrical construction angles and triangles.	Faction and decimals conversion fraction to decimal and vice-versa.
6.	Threading with the help of taps and dies	Surface plate its necessity and use. Tap, - different types (Taper 2 nd and bottoming) care while tapping. Dies different types and uses. Calculation involved to find Out drill size (Metric and Inch).	Geometrical construction of rectangle, square, circles and triangles.	Properties and uses of copper, zinc, lead, tin aluminum.
7.	Getting to know the lathe with its main components, lever positions and various lubrication points as well.	Definition of machine & machine tool and its classification. History And gradual development of lathe.	Geometrical drawing of polygons and ellipse.	-do-
8	Mounting of chuck on machine spindle and unloading in various system.	Classification of lathe in Function and construction of different parts of Lathe.	-do-	Composition, Properties and uses of brass, bronze, solder , bearing metal, timber , rubber etc.

9	Turning of round stock on 4-jaw independent chuck. Use of 3-jaw self centering chuck as well.	Types of lathe drivers, merit and demerit. Description in details-head stock-cone pulley type-all geared type-construction & function. Tumbler gear set.	-do-	System of units. British, Metric & SI units for length, area, volume, capacity, weight, time angle, their conversions. Effect of alloying elements on the property of C.I. and steel
10.	Progress Test.	Reducing speed-necessary & uses. Back Gear Unit -its construction and speed calculation.	- do-	
11	Grinding of R.H. and L.H., side cutting tools, checking of angles with tools angle gauge.	Orthogonal & oblique cutting, Lathe cutting tool-different types, shapes and different angles (clearances and rakes), specification of lathe tools	Free hand sketching of simple geometrical solids-cube, cone, prism, cylinder, sphere, pyramids.	Units of temperature & conversion of different system of temperature and related problems
12	Setting of lathe tools in different types of tool post following correct procedure.	Different types of lathe tool posts Function of quick change gear box, feed shaft, lead screw etc..	Standard printing style for letters & numbers as per BIS : 696	Mass, volume, density, specific gravity & specific weight, S.I., M.K.S. and F.P.S. units of force, weight etc., their conversion & related problems.
13	Facing operation to correct length, center drilling operation,. Grinding of "V" tools.	Combination drill- appropriate selection of size from chart of combination drill. Drill, chuck-its uses.	Free hand practice of printing style for standard letters and number.	-do-
14	Parallel turning practice-measurement with scale and caliper.	Cutting speed, feed depth of cut, calculation involved-speed feed R.P.M. etc. recommended for different materials.	Scales construction of plain scale. R.F.(Representative fraction).	Inertia, rest and motion, velocity and acceleration.

ACHIEVEMENT : Checking by Test:

1. Tool grinding-different shapes, different angles.
2. Parallel turning-measurement with scale and caliper.
3. Theory question on tool angles cutting speed; feed, depth of cut etc.

15	Step turning with ± 0.08 mm measurement with vernier caliper.	Vernier caliper-its construction, principle graduation and reading, least count etc. Digital vernier caliper.	Construction of diagonal scale.	Concept of scalar & vector quantity with example. Newton's Law of motion.
16	Parallel turning practice measurement with micrometer within ± 0.08 mm accuracy.	Outside micrometer -different parts, principle, graduation, reading, construction. Digital micrometer.	Simple dimensioning technique; size and location of dimension for parts, holes, angles taper, screws etc. as per IS: 696	Power and Roots Factor, power, base exponents.
17	Step turning practice within ± 0.08 mm with SQ, shoulder, U/cut, feel of micrometer, sources of error with micrometer	Different types of micrometer, Outside micrometer. Vernier scale graduation and reading. Sources of error with micrometer & how to avoid them. Use of digital measuring instruments.	Transferring measurement for linear, angular, circular dimension from the given objects to the related free hand sketches using different measuring instruments. Pictorial drawing of isometric drawing of simple geometrical solids	Multiplication and division of power and root of a number.
18	Drilling on Lathe-step drilling, drill grinding practice.	Lathe accessories, chuck independent, self centering, collect, magnetic etc., its function, construction and uses. Drills-different parts, types, sizes etc., different cutting angles, cutting speed for different material. Boring tool. Counter - sinking and Counter boring.	-do-	Square root by arithmetic and problems.
19	Boring practice-Plain & step, use of inside micrometer-with ± 0.08 mm accuracy			Work, Energy and Power, their units- related problems

20	Bore (Plain) measurement with inside micrometer ± 0.08 mm.	Letter and number drill, core drill etc.	Oblique projection of simple geometrical solids	H.P., I.H.P. and B.H.P., Efficiency and related problems
21	Boring & internal recessing	Driving plate. Face plate & fixed & traveling steadies- construction and use. Transfer caliper-its construction and uses.	- do -	Percentage, changing percentage to decimal and vice-versa.
22	Checking alignment of lathe centers. Mounting job in between centers	Lathe centers-types and their uses. Lathe carrier-function, types & uses.	Isometric drawing of simple machined & casting block	Problem on percentage related to trade
23	Reaming in lathe using solid and adjustable reamer.	Reamers-types and uses. Lubricant and coolant-types, necessity, system of distribution, selection of coolant for different material: Handling and care.	-Do -	Meaning of stress, strain, modulus of elasticity.
24	Knurling practice in lathe (Diamond, straight, helical & square)	Knurling meaning, necessity, types, grade, cutting speed for knurling.	-Do-	Ultimate strength, different types of stress, factor of safety and examples.

ACHIEVEMENT

1. Drilling.
2. Boring: (a) Plain & (b) Stepped 0.05 mm accuracy.
3. Knurling operation- Theory-question on micrometer, vernier caliper, countersinking, counter boring, reaming etc.

20	Bore (Plain) measurement with inside micrometer ± 0.08 mm.	Letter and number drill, core drill etc.	Oblique projection of simple geometrical solids	H.P., I.H.P. and B.H.P., Efficiency and related problems
21	Boring & internal recessing	Driving plate. Face plate & fixed & traveling steadies- construction and use. Transfer caliper-its construction and uses.	- do -	Percentage, changing percentage to decimal and vice-versa.
22	Checking alignment of lathe centers. Mounting job in between centers	Lathe centers-types and their uses. Lathe carrier-function, types & uses.	Isometric drawing of simple machined & casting block	Problem on percentage related to trade
23	Reaming in lathe using solid and adjustable reamer.	Reamers-types and uses. Lubricant and coolant-types, necessity, system of distribution, selection of coolant for different material: Handling and care.	-Do -	Meaning of stress, strain, modulus of elasticity.
24	Knurling practice in lathe (Diamond, straight, helical & square)	Knurling meaning, necessity, types, grade, cutting speed for knurling.	-Do-	Ultimate strength, different types of stress, factor of safety and examples.

ACHIEVEMENT

1. Drilling.
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3. Knurling operation- Theory-question on micrometer, vernier caliper, countersinking, counter boring, reaming etc.

25	Turning practice-between centers on mandrel (Gear blanks)	Lathe mandrel-different types and their uses	Free hand sketching of trades related hand tools , cutting tools, measuring instruments	- Do -
26	Fitting of dissimilar materials- H.S.in brass,aluminium, in cast iron etc.	Concept of interchangeability, Limit, Fit and tolerance as per BIS :919-unilateral and bilateral system of limit, Fits- different types, symbols for holes and shafts. Hole basis & shaft basis etc. Representation of Tolerance in drawing.	- Do -	Ratio and proportions and related problems, direct proportion and indirect proportion
27	Industrial Visit to Different Industries	Industrial Visit to Different Industries	Industrial Visit to Different Industries	Industrial Visit to Different Industries
28	Taper turning by offsetting tailstock method	Taper – necessity, different methods of expressing tapers. Different standard tapers, method of taper turning, important dimensions of taper, Principle of setting the work & the tailstock, calculation involving the tailstock offset method- Advantage & Disadvantage	- Do -	Simple machines- principle, velocity ratio, mechanical advantage, efficiency, simple problem.
29	Taper turning by offsetting tailstock method.	- Do -	- Do -	Simple machines principle-Velocity ratio, mechanical advantage, efficiency. Simple Problems
30	Taper turning by compound slide swiveling	Taper turning by swiveling compound slide, its calculation.	Orthographic drawing-application of both the	Fundamental Algebraic Operations :

		Advantages & disadvantages	first angle and third angle method in representing the drawing for simple and complex machine blocks given for exercises with dimensions.	Sign & symbols used in algebra.
31	-DO - (bevel gear blank)	Vernier bevel protractor-its function, Construction & reading	-Do-	and Algebraic addition, subtraction, multiplication division.
32	Taper turning by taper turning attachment , practice (Male & Female).	Taper turning by taper turning Attachment-principle setting, advantages & disadvantages, calculation involved.	- Do -	Power & laws of exponent.
33	-Do-	-Do-	-Do-	Algebraic-simplification problems
34	Taper turning by form tool (Int. & Ext.) (Taper matching)	Different types of form tool & their uses.	Standard method as per BIS: 696. Exercises for different sectional views on the given orthographic drawing of machine parts, castings etc	Simple machine like Winch, Pulley and compound axle etc.

ACHIEVEMENT; Checking by Test

1. Fitting of dissimilar materials within specified tools.
2. Taper turning-gauge to suit + 0.5 deg. Accuracy.
3. Theory -question on different methods of taper, turning

35.	Eccentric marking practice- Eccentric turning- External use of Vernier height Gauge.	Combination set-square head. Center head, protractor head-its function construction and uses.	-do-	Factor and equation: Algebraic formulae.
36.	Eccentric turning practice-External and internal.	Gauge-definition-different types plug and ring gauge, filler gauge angle gauge and radius gauge.	-do-	Factor and different types of factorization.
37.	Eccentric boring, position boring.	Vernier height gauge, function, description & uses, templates-its function and construction.	-do-	Equation, simple simultaneous, simultaneous eqn.
38	Eccentric boring & position boring. Grinding of threading tool (external.)	Screw thread-definition, purpose & its different elements. Fundamentals of thread cutting on lathe.	Conversion isometric drawing to orthographic drawing and vice versa related problems such as Vee blocks, simple stepped blocks, blocks oriented by various machining operations etc.	Equations simple, simultaneous, quadratic. Application, construction and solution of problems by equations.
39	Screw thread cutting (B.S.W) external R/H & L/H, checking of thread by using screw thread gauge.	Different types of screw thread- their forms and elements.	-do-	Atmospheric pressure, pressure gauge, gauge pressure and absolute pressure and their units.
40	Screw thread cutting (B.S.W) internal R/H & L/H	Different methods of forming threads . Calculation involved in finding core dia., gear train (simple gearing) calculation.	-do-	Logarithms and use of logarithms tables & anti- logarithms tables.
41	Fitting of male & female threaded components	Calculation involving driver- driven, lead screw pitch and thread to be cut. Tread chasing	- do -	Problem related to trade using logarithm tables.

42	Screw thread cutting (External) metric thread- tool grinding	dial function, construction and use. Calculation involving pitch related to ISO profile.	- do -	- do -
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ACHIEVEMENT : Checking by Test.

1. Eccentric turning and boring.
2. Thread fitting.
3. Theory- Question on screw thread profile, B.S.W., Metric etc., gear train calculation for screw cutting

	thread (Ext. & Int.) non-ferrous material	Dies-different types, Die stock.	solids of simple geometrical solids-cube, rectangular block, cone, pyramid, cylindrical prism etc.	
44	Screw thread (Internal) metric & tool (Internal threading) grinding	Conventional chart for different profiles, metric, B.A., Withworth, pipe etc.	- do -	Specific Gravity-principle of Archimedes.
45	Fitting of male and female thread components (Metric)	Calculation involving gear ratios and gearing (compound gearing)	- do -	Relation between specific gravity & specific weight.
46- 47	Tool grinding for Sq.thread (External), Sq.thread (External) practice Tool grinding for Sq.thread (Internal), Sq.thread (Internal) practice	Calculation involving tool size, core dia., pitch proportion, depth of cut etc. of sq. thread..	Interpretation of solids and conventional curve on drawings.	Geometry: Fundamental geometrical definition of angle and properties of triangle. Triangle and properties. Pythagoras Theorem , properties of similar triangles.
48.	Fitting of male and female square threaded components.	Basic process of soldering, welding and brazing.	Solution of NCVT test papers	Revision.
49	Acme thread cutting (male & female) & tool grinding.	Calculation involved -depth, core dia.,pitch proportion etc. of Acme thread.	Sketches of simple pipe union with a simple pipe line drawings.	- do -
50	Fitting of male and female threaded components	Calculation involved depth, core dia.,pitch proportion, use of buttress thread.	- do -	Solution of NCVT test papers
51	Buttress thread cutting (male & female) & tool grinding	Buttress thread cutting (male & female) & tool grinding	Solution of NCVT test paper	- do -
52	Fitting of male & female threaded components	Revision.	- do -	- do -

ACHIEVEMENT : Checking by Test :

1. Use of hand (Ext. & Int.) chaser on non-ferrous material.
2. Fitting of thread components (Metric 60, Square, Acme, Buttress).
3. Theory- Questions on different types of threads, lathe setup for thread cutting etc., depth micrometer.

Final Achievement after One Year : Will be able to perform the following operations

Lathe tool grinding, parallel turning, stepped turning, boring, taper turning, thread cutting (Vee Threads, square, Acme, Buttress) and fitting within of 0.05 mm.

53	Introduction to various components produced on lathe.	Review of lathe machine, its classification for productivity. Revision of first year topics.	Screw threads, their stand and forms as per BIS, external & internal thread convention on the features for drawing.	Solid figures-Prism, cylinder, pyramid, cone
54	Forging practice (lathe tool) of different shapes, heat treatment of tools.	Cutting tool material- H.C.S., H.S.S., Stellite, Tungsten Carbide, Ceramic etc, - Constituents and their percentage. Tool life required, quality of a cutting material.	- do -	do
55	Form turning practice (by hand)	Form tools-function-types and uses, Template-purpose & use. Dial test indicator- construction & uses	Sketches for bolts, nuts, screws and other screwed Members	do
56	Grinding and setting of parting off tool on tool post	Calculation involving modified rake and clearance angles of lathe tool at above and below the center height. Subsequent effect of tool setting.	- do -	Frustum of Prism, cylinder

57	Grinding up of various shape of chip breaker on tool	Jig and fixture-definition, type and use. Chip breaker on tool-purpose and type	Standard rivet form as per BIS	do
58	Taper turning by taper turning attachment, Morse taper- different number.	Sine bar-construction-types and use. Slip, uses and selection. gauges-types.	Riveted joints-lap and butt.	Frustum of Pyramid
59	Internal taper turning by taper turning attachment. Taper matching exercise (application of Prussian blue, Plug and Ring gauge)	Checking of taper with sin bar and roller-calculation involved	Sketching of keys, cotter and pin joints.	Do
60	Turning and boring practice on C.I. block & tip brazing on shank.	Method of brazing solder, flux used for tip tools..	- do -	Frustum of cone

ACHIEVEMENT : Checking by test :

1. Form turning, taper turning and matching
2. Proper grinding and setting of parting-off tool.
3. Theory-Question on cutting tool material & angles, sine bar, dial test indicator, slip gauges, brazing of tips.

61.	Turning at high speed using tungsten carbide tools including throw-away tips	Cutting speed, feed, turning time, depth of cut calculation, cutting speed chart (tungsten carbide tool) etc Basic classification of tungsten carbide tips.	Concept of preparation of assembly drawing and detailing. Simple assemblies & their details of trade related tools/jobs/exercises from the given samples, models. Tool post for the lathe with washer & screws	do.
62	Practice of negative rake tool on non-ferrous metal.	Tool life, negative top rake-its application and performance with respect to positive top rake	-do -	Frustum of sphere, spherical segment.
63	Balancing, mounting & dressing of grinding wheel (Pedestal). Adjustment of tool post.	Lubricant-function, types, sources of lubricant. Method of lubrication. Dial test indicator use for parallelism and concentricity etc. in respect of lathe work Grinding wheel abrasive, grit, grade, bond etc.	- do -	Material weight and problems related to trade.
64	Periodical lubrication procedure on lathe, testing of accuracy of alignment. Procedure of checking accuracy of lathe. Preventive maintenance of lathe.	Preventive maintenance, its necessity, frequency of lubrication. Preventive maintenance schedule., TPM (Total Productive Maintenance), EHS (Environment, heats, Safety)	Details and assembly of Vee-blocks with clamps	Trigonometry : Trigonometrical ratios, use of trigonometrical tables.
65.	Industrial visit to different industries to gather knowledge about the machinery, operations etc. which are not available/ Performed in the Institute i.e. special purpose lathe, programme control machine etc.			

66.	Crankshaft – single throw (Desirable)	Marking table-construction and function. Angle plate-construction, eccentricity checking.	Details and assembly up Vee-blocks with clamps.	Area of triangle by trigonometry.
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ACHIEVEMENT;

1. Preventive maintenance of lathe.
2. Balancing, mounting addressing of grinding wheel (Pedestal)
3. Theory- Questions on Preventive, maintenance of lathe, cutting speed, feed & turning time calculation, method of lubrication.

67	Turning of long shaft (using steadies) (with in a 0.03 mm).	Roller and revolving steadies, Necessary, construction, uses etc.	Details and assembly of shaft and pulley.	Finding height and distance trigonometry
68..	Cutting metric threads on inch, lead screw and inch threads on Metric Lead Screw.	Calculation involving gear ratios metric threads cutting on inch L/S Lathe and vice-versa.	-do-	.Application of trigonometry to related problems.
69.	Use of attachments on lathe for different operations.	Different types of attachments used in lathe.	Details and assembly of Bush Bearing.	-do-
70.	Thread cutting on non-ferrous metals-copper aluminum brass etc.	Various procedures of thread measurement thread screw pitch gauge.	-do-	Triangle of forces, Parallelogram of forces.
71.	Advanced eccentric boring (position boring using tool maker's button.)	Screw thread micrometer, tool maker, microscope etc.; Tool maker's button and its parts, construction and uses, telescopic gauge its construction and uses.	Details and assembly of simple coupling	Composition and resolution of force.

72.	Boring and stepped boring (within 0.05 mm)	Inside micrometer principle, construction graduation, reading, use etc. (Metric & Inch.)	-do-	Representation of forces by vectors-simple problems on lifting tackles like jib cranes.
73.	Continuation of thread cutting. Fractional odd & even threads.	Calculation involving fractional threads. Odd & even threads.	Details and assembly of simple hand vice.	-do-

ACHIEVEMENT; Checking by Test:

1. Turning within close limit a 0.05 mm micrometer.
2. Using tool maker's button using I/S micrometer.
3. Theory – Questioning on cutting B.S.W. threads on metric lead screw and vice-versa.
Tool Maker's Button threads gauges etc.

74.	Multiple thread cutting (B.S.W.) external & internal.	Multiple thread function, use, different between pitch & lead, formulate to find out start, pitch, lead. Gear ratio etc.	Details and assembly of a simple hand vice.	Moment of a force couples. Simple problems on straight and bell cranked lever.
75.	Multiple thread cutting 60 deg. (external & internal)	Indexing of start - different methods tool shape for multi- start thread. Setting of a lathe calculation for required change wheel	- do -	Centre of gravity. Simple experimental determination. Equilibrium - Stable, unstable and neutral equilibrium - simple explanation.
76.	Multiple thread cutting Acme form (Male & Female)	Calculation involving shape of tool, change wheel, core dia etc.	-do-	-do-
77.	Multiple thread cutting square form (Male & Female)	Calculation involving shape, size pitch, core dia. Etc.	Blue print reading - Simple exercises related to missing lines.	Fraction - Co-efficient of friction.
78.	Multiple thread cutting, square form (Male & Female)	Helix angle, leading angle & following angles.	-do-	Simple problems related to friction.
79.	Multiple thread cutting work (External)	Thread dimensions-tool shape, gear, gear calculation, pitch, depth, lead etc.	Blue print reading- simple exercises related to missing views.	Magnetic substances- natural and artificial magnets.
80.	Cutting of helical grooves in bearing and bushes (Oil groove)	Heat treatment - meaning & procedure hardening, tempering, carbonizing etc.	-do-	Methods of magnetization -uses of magnets.

ACHIEVEMENT: Checking by Test:

1. Turning within close limits a 0.05 mm accuracy.
2. Single throws crank shaft turning (Desirable)
3. Multiple thread fitting.
4. Theory- Question on cutting multi-start threads, indexing of start, pitch, lead etc.

81	Setting and operation involving face and angle plate	Accessories used on face plate – their uses. Angle plate-its construction & use. Balancing-its necessity.	Simple exercises related to missing symbols	Electricity & its uses, electric current- positive & negative terminals.
82	Turning & boring of split bearing – (using boring bar and fixture)	Care for holding split bearing. Fixture and its use in turning.	- do -	Use of fuses and switches, conductors and insulators.
83	Thread on taper surface (Vee form).	Setting of tool for taper threads- calculation of taper setting and thread depth.	Simple exercises related to missing symbols.	Simple electric circuits. Simple calculation.
84	Introduction to various features of CNC machine – control switches, drive operating buttons and specification	Conceptualisation of CNC technology. Difference of CNC machines to general purpose machine & automatic machines. Advantages & disadvantages of CNC machines over GPMs. Difference between NC and CNC. Schematic diagram of CNC system	-do-	Ohm's law-simple calculation, electrical insulating materials. Practice on simple pocket calculator.
85	Programming of CNC machines- Introduction to CNC machine, part programming with simple exercises	Programming – Sequence, formats, different codes, sub routines, methods, writing &	-do-	Mechanical properties of metals.

86	and various programming code. Simple examples of programming and cutting Operating the CNC machine in the manual SBL and auto mode . Programming loading and machine setting. Procedure for reaching reference point . Setting Zero off-set G54, G55, G56, G57. switching the machine of tool off-set	editing. Geometry and Coordinate system... IMC panel, keys and display panel. EMCO control panel. Data processing unit and Control logic unit Programming execution in different mode s like SBL, manual and auto. Knowledge on CNC cutting tools-Geometry, material, cutting speed, feed, and depth of cut. Techniques of tool off-setting and tool setting. Prepare various programmes as per drawing.	-do-	Graphs: Abscissa and ordinates groups of straight line related two sets of varying quantities. Heat treatment of steel – hardening, tempering, annealing etc.
87	Simple work on CNC trainer lathe with parallel, taper, step, radius turning, grooving and threading of different pitches.	Tool type chart, decide the G41 and G42. Surface finish-Primary and Secondary. Surface roughness related BIS symbols	- do -	- do -
88-89	Introduction to conventional Milling operation. Practice on CNC Milling Machine By using different codes	Different types of milling machines and operations. Techniques of CNC programming	- do -	- do -
90	Practice on CNC drilling	Related Theory	- do -	- do -

ACHIEVEMENT: Checking by Test:

1. Face plate work on lathe.
2. CNC operation & simple programming

91 to 95	Project work on lathe work-different types of circular fittings, different types of thread cutting etc.	Special lathe-copying relieving turning axle turning etc. Relieving lathe-its type operational features-calculation of gearing etc. Detailed description about the typical work and cam arrangement etc. Surface finish symbols used on working blueprints- I.S. system lapping, honing etc. Automatic lathe-its main parts, types diff. Tools used-circular tool etc.	Solution of NCVT, test paper.	Heat treatment of steel Hardening, annealing, tempering, normalizing, cast hardening-standard and measurement. Transmission of power by belt pulley n& gear drive. Solution of NCVT question papers.
96.	Project work-useful articles different type fittings.	Interchangeability meaning procedure for adoption, quality control procedure for quality production.	Revision -do-	Revision
97.	Project work-useful articles (different type fittings).	Interchangeability- meaning, control procedure for quality	Revision	Revision

ACHIEVEMENT

1. Interchangeability System
2. Surface finish symbols used on working blueprints
3. Use of circular tools

98-100	Practice of different operations related to trade on CNC machine	Different types of programming techniques of CNC machine	Revision	Revision
101	Industrial tour	Industrial tour	Industrial tour	Industrial tour
102-103	Work order from local industries (Production type)	Solution of NCVT question papers	Solution of NCVT question papers	Solution of NCVT question papers
104	NCVT TEST	NCVT TEST	NCVT TEST	NCVT TEST

FINAL ACHIEVEMENT AFTER TWO YEARS:

Will be able to perform the following operation:

Taper machining, tungsten carbide tool grinding, stepped boring and fitting, boring with tool maker's button, different thread cutting, crank shaft turning, angle and face plate work, taper thread cutting, CNC trainer lathe operating and simple programming, etc.
Accuracy ± 0.04 mm and 5' angular surface.

LIST OF TOOLS AND EQUIPMENTS FOR THE TRADE OF TURNER
FOR THE BATCH OF 12 TRAINEES

Period of Training—2 Years

Sl. No.	Description	For Instructor	For Trainees
1	2	3	4
1	Caliper out side firm spring joint 150 mm	1 No	12 Nos. each
2	Caliper inside firm and spring joint 150 mm	1 No	12 Nos. each
3	Caliper odd-leg firm joint 150 mm	1 No..	12 Nos. each
4	Steel Rule 150 mm to read metric	1 No..	12 nos. each
5	Scriber 150mm x 3 mm	1 No.	12 nos. each
6.	Hammer ball pein 250 gm with handle	1 no.	12 nos. each
7	Centre punch 100 mm	1 no.	12 nos. each
8	Prick punch 100 mm	1 no.	12 nos. each
9	Divider spring joint 150 mm	1 no.	12 nos. each
10	Safety goggles clear glass (Good quality)	1 no.	12 nos. each
TOOLS, EQUIPMENTS AND GENERAL OUTFIT			
11	Surface plate 60 x 60 cm		1 no.
12	Work bench 240 x 120x 90cm high		1 no.
13	Marking table (CI) 120 x 120 cm		1 no.
14	Bench vice 125 mm jaw		6 nos.
15	Vee-Block 75 and 125 mm with clamp		1 pair each
16	Universal Surface gauge 250 mm arm		2 nos.
17	Hammer ball pein 750 gm with handle		6 nos.
18	Chisel cold flat 20 x 150 mm		6 nos.
19	Hammer copper/brass 500 gm with handle		12 nos.
20	Hacksaw fixed 200 mm (Pistol grip)		6 nos.
21	File flat 300 mm rough		6 nos.
22	File flat 250 mm 2 nd cut		6 nos.
23	File flat 250 mm smooth		6 nos.
24	File half round 250 mm 2 nd cut		6 nos.
25	File round 250 mm smooth	1 no.	6 nos

26	File half round 150 mm smooth	1 no.	2 Sets
27	Knurling tool revolving head (Rough, med, fine) diamond and straight		2 Sets
28	Combination set 300 mm (Complete Set)		6 Nos.
29	Screw Driver 200 & 300 blade heavy duty		2 sets each
30	Spanner double ended 6 mm to 21 mm	1 set	2 Nos
31	Spanner adjustable 200 mm	1 no.	1 No. 12 nos.
32	Pliers flat nose 150 mm side cutting	1 no.	3 nos.
33	Caliper transfer inside 150 mm		
34	Micrometer Outside 0 to 1" Reading 0.0001"	1 no.	2 sets
35	Micrometer Outside 0 to 25 mm Reading 0.01 mm	1 no.	2 nos.
36	Micrometer Outside 25 to 50 mm Reading 0.01 mm	----	2 sets
37	Micrometer Outside 50 to 75 mm Reading 0.01 mm	----	2 nos.
38	Micrometer Inside up to 25 mm Reading 0.01 mm	1set	2 nos.
39	Micrometer Inside up to 50 to 150 mm reading 0.01 mm	----	2 nos.
40	Depth Gauge Micrometer 0 to 150 mm Reading 0.01 mm	----	---
41	Vernier Caliper Outside, Inside and Depth 200 mm /8 inches with metric & inch scale	1 No.	6 nos.
42	Dial Vernier Caliper with metric 200 mm reading 0.05 mm	1 No	6 nos.
43	Vernier Bevel Protractor 300 mm blade	-----	2 nos.
44	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	1 No	2 sets
45	Vernier Micrometer 25 - 50 mm outside reading 0.001mm	1 No.	2 nos.
46.	Vernier Micrometer 0 inch to 1 inch. Outside Reading 0.0001 inch	1 No.	2 sets
47	Feeler Gauge 100 mm blade metric set		6 Nos
48	Radius Gauge 1 to 7 mm & 7.5 to 15 mm		----
49	Centre Gauge com. 60°, 55° and 29°		2 sets
50	Screw Pitch Gauge Witworth & Metric each		----
51	Drill Angle Gauge		----
52	Dial Test Indicator 0.01 mm with magnetic base		
53	Vernier Height Gauge with dial 300 mm L.C. 0.01 mm		
54	Try Square 150 blade		1 No.
55	Magnifying Glass 75 mm dia.		2 Nos.
56	Plain Ring and Plug Gauge 12 to 50 mm by 1mm		1 No
57	Wheel Dresser Huntingon-type with star cutter		1 set
58	Wheel Dresser Diamond (inserted-0.75 or 1 Carat)		2 Nos.
59	Screw Thread micrometer interchangeable	1 No.	2 Nos.
60	Morse Taper Plug & Ring Gauge no. 0 to 7 MT		---
61	Sin Bar with centers 200 mm		1 Set.
62	Slip Gauge metric set (87 pieces in a Box)		1 No.
63	Morse Taper Sleeves No. 0-1, 1-2, 2-3, 3-4, 4-5.		1 set (Box)
64	Drill Drift		2 Sets.
65	Twist Drill straight shank 1 to 12 mm by 1 mm		2 Nos...
66	Twist Drill taper shank 10-12 mm by 0.5 mm		2 Sets
67	Drill Chuck 12 mm cap with key		2 Sets.
68	Tap & Die B.A. No. 0 to 10 in a box		2 Nos.
69	Tap & Die metric set up to 25 mm		1 Set
70	Tap & Die B.S.F. up to 1 inch		2 Sets.

71	Tap & Die B.S.W. up to 1 inch		1 Set.
72	Reamer machine straight flute 6 to 25 mm		2 Sets.
73	Reamer Adjustable 10 to 20 mm		1 set.
74	Tool Holder RH & straight for mm square tool bit		1 No.
75	Parting Tool Holder with H.S.S. blade		12 Nos.
76	Tool Bits 12 X 150 mm sq. assorted shaped		12 Nos.
77	Boring Tool holder for 6 mm sq. tool bit		12 Nos.
78	Steel Rule 300 mm with Metric and Inch		12 Nos.
79	Oil Can ½ pint (pressure feed system)		12 Nos.
80	Dog Carrier 235, 50 and 75 mm		12 Nos.
81	Angle Plate with slots 200 mm		12 Nos.
82	Spirit Level 0.05 meter 200 m		2 Nos.
83	Tool Maker's button		1 set
84	Combination Drill A-2.5 and A-1		1 set
85	Oil Stone 12 mm sq. x 100 long fine		12 nos.
86	Tap Wrench (adjustable)		12 Nos.
87	Die Handle		2 Nos.
88	Tool Bit assorted sizes on holder		2 Nos.
89	Machine Vice 100 mm jaw (For Drill Machine)		12 Nos.
90	Chalk Board on mobile stand		1 No.
91	Spare Grinding Wheel Ajax type for carbide tool		1 No.
92	Almirah-1980x 910 x 480 mm		2 No.
93	St. Locker with drawer (Pigeon holes)		1 No.
94	Desk		1 No.
95	Stool		4 Nos.
96	Angle Gauge for tool grinding	1 No.	6 Nos.
97	Hand Chaser M-12 & M-16 (External)		2 Nos.
98	Hand Chaser M-12 & M-16 (Internal)		2 Nos.
99	Revolving Centrer (to suit Lathe tailstock)		6 Nos.
100	Tool Cemented carbide assorted shaped (External) for steel turning -set of 12 nos.		2 Nos.
101	Tread Plug Gauge M-20 & M-21		1 No.
102	Thread Ring Gauge M-20 & M-21		1 No.
103	Machine Chase M-12TO m-21 (Std. Series) to suit on		1 set
104	Coventry Die head		2 Nos.
105	Gauge Drill Grinding		1 No.
106	Magnetic Chuck 150 mm dia. (Circular type)		1 set.
107	Lathe Mandrels (Diff. Types)		1 No.
108	Conventry Type Die Head (Self opening)		1 No.
109	Collapsible Tap with attachment		2 Nos.
110	Combination Drill		4 Nos. each.
111	Fire Extinguisher and buckets		12 nos.
			2 nos.

- Note : 1. No additional item of the above list are required for a batch of 12 trainees working in second shift except Serial No. 1 to 10 and lockers
2. The specification of the items in the above list has been given in metric units. The items, which are available in the market nearest to specification as mentioned above, should be procured.

LIST OF MACHINERIES AND EQUIPMENTS FOR THE TRADE OF TURNER
(For a Batch of 12 trainees)

Period of Training: 2 Years

Sl.No.	Machinery and Equipment	Quantity	Remarks
1	2	3	4
01	Lathe S.S. & S.C. (All geared head stock) 15 cm center height, to admit 120 cm between centers. Machine to be motorized and supplied with coolant installation, 1-jaw Independent chuck 250 mm, 3-jaw self-centering chuck 150 mm, fixed steady, traveling steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric or British threads, live and dead centers with taper attachments.	1 4 nos.	
02	Lathe S.S & S.C.(all geared type) 20 cm. Center height, 120 cm between centers, gap bed machine to be motorized and supplied with coolant installation, 4-jaw independent chuck, 300 mm , 3-jaw self-centering chuck 200 mm fixed steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric/British threads, live and dead centers with taper attachments.	1 no.	
03	Lathe tool room S.S. & S.C. (all geared type) 15 cm center height, 120 cm between centers. Machine to be motorized and supplied with coolant installation, 1-jaw independent chuck 250 mm, 3-jaw self-centering chuck 150 mm fixed steady, traveling steady, face plate, driving plate, 1-way tool post, draw in type collets set up to 25 mm, 0.5 mm, relieving attachments.		
04	Lathe S.S. & S.C (Cone pulley type) 15 cm height 90 cm between centers. Machine to be motorized 1-jaw independent chuck 250 mm, 3-jaw self-centering chuck, 150 mm single tool post.	1 no.	For demonstration purpose.
05	Grinding machine pedestal type D.E. 150 mm dia. Wheel with wheel guard and vision.	1 no.	
06.	Grinding machine pedestal type E.E. 150 mm dia. Wheel with wheel and vision guard	1 no.	
07.	Drill machine pillar type-motorized up to 12 mm. Cap.	1 no.	
08.	Power saw machine – hydraulic feed system – 400 mm. Blade size.	1 no.	
09.	Capstan Lathe 250 mm sawing, 25 mm spindle bore with all accessories and attachment including collect chucks and sets.	1 no.	

**LIST OF ADDITIONAL MACHINES, TOOLS & EQUIPMENT FOR
TWO UNITS (CNC)**

Sl. No.	Description	Quantity
1	2	3
1	CNC Trainer Lathe	1 No.
2	CNC Turning Tools assorted	1 set
3	CNC Boring tools assorted	1 set
4	CNC Grooving tools (External & Internal)	1 set
5	VCP	1 no.
6	Color TV Monitor	1 no.
7	Related Video & Audio Cassette	as required
8	Electronic Vernier Caliper inch and mm 8"/200 mm. LCM 0.005"/0.001 mm	2 nos.
9	Dig metric electronic outside Micrometer (0 to 25 mm & 25 to 50 mm) LC 0.001 mm.	1 no. each
10	CNC Trainer Drilling	1 no.
11	CNC Trainer Miller	1 no.

Note:

- No. additional items of the above lists are to be provided for a batch of 12 trainees working in the second shift.
- List of ISI Books for the use of Instructors to be enlisted as mentioned in the syllabus.

SYLLABUS FOR THE TRADE OF TURNER UNDER APPRENTICESHIP TRAINING SCHEME

Period of Training: 3 years

NOTE :

For 1st and 2nd Year Training:

The content of the syllabus for the apprentices during 1st and 2nd year training should be the same as that of the 1st and 2nd year syllabus and tools, equipment, machineries etc. of craftsmanship course in this trade.

Practical (shop) Training – 3rd Year:

1. Introduction to safety precautions on the shop floor.
2. Forging of cold chisels, lathe carrier and lathe tools.
3. Hardening and tempering of chisels and lathe tools.
4. Normalising and annealing practice.
5. Simple soldering practice.
6. Brazing of H.S.S. and tungsten carbide tips on shank.
7. Practice on shaping machine.
8. Practice on milling machine.
9. Practice on boring (Horizontal) machine and also thread cutting.
10. Use of boring bar, spot facing operation etc.
11. Practice in parting off tubes on lathe.
12. Use of jig and fixture on lathe operation.
13. Trepanning operation practice.
14. Further thread cutting practice (different types).
15. Treaded taper plug (fitting) practice.
16. Use of cemented carbide tools having negative rake angles.
17. Use of machine chaser (tangential type) with the head.
18. Use of taper turning attachment.
19. Use of copying and relieving attachments (if facilities available).
20. Use of gauges and templates.
21. Use of sin bar and slip gauges.
22. Fitting practice-combination of step, taper, threads, concentric etc.
23. Using profile projector / tool maker's microscope for checking of turned work pieces (if facilities available).
24. Use of bore dial gauge.
25. Determination of exact machining allowance as per BIS norms from shop drawing s of work pieces to be machined.
26. Inspection of turned work pieces by measuring instruments and gauges.
27. Routine maintenance of machines.
28. Checking of eccentricity.
29. Use of gauges, jigs, fixtures, etc. for production work.

- Note:**
1. The operation / skills must be carried out where facilities are available in the establishment.
 2. Utility jobs-such as actual machine parts-components, accessories etc.Should be given to Apprentices for machining
 3. Assignment should be planned so that the apprentices may spend 20% of the total time of production type of work (using gauges , templates, fixtures etc.) for developing their skill and confidence about manufacturing which will help ever in self-employment, if found necessary in the future.

RELATED INSTRUCTION (THIRD YEAR)

The syllabus given for Related Instructions should be considered as a guide:
Subject to be taught to the apprentices are given here under:

1. Trade Theory
2. Workshop Calculation & Science
3. Engineering Drawing.
4. Social Studies

A- TRADE THEORY

1. Safety at work-accidents does not happen they are caused-prevention of accident.
2. Revision of work of previous two years.
3. Brief description of common machine tools used in machine shop such as shaper, slotters, millers, grinders, bidders etc
4. Shop Layout-Importance of shop layout in relation to the flow of production principles of machine location with reference to adequate space, lighting, safety and other convenience.
5. Brief description of special machine tools related to trade such as automatic lathe, CNC lathe etc. their special features.
6. Machine ability of different metals such as mild steel, cast iron, carbon steel, aluminum brass, bronze, etc. and non-metallic materials like plastics, fiber rubber etc. and also calculation involved.
7. Importance of proper use of cutting fluids and lubricants-their properties and practical applications.
8. Heat Treatment-Heat treatment of high speed steel-furnace for hardening H.S.S. such as muffle furnace, salt bath etc. cyaniding and nitrogen hardening, gas carbonizing processes etc.
9. Hydraulic and Pneumatic mechanism in machine tools related to the trade.
10. Routine maintenance of the machine tools related to the trade.
11. Use of manufactures catalogue, hand tools, table and other data.
12. Surface finish-importance of quality finish of jobs at all stages-introduction to surface finish-ISI symbols for accuracy possible with different type of lathe.
13. Inspection-Reduction of scrap by stage inspection-introduction to auto-inspection, device tool maker's microscope, optical projector etc.
14. Modern Development-Description of programme control, electric discharge machining (EDM) electro-chemical machining (ECM) methods etc.
15. Introduction to work simplification-Related to the trade to study- job analysis, job care, route card planning of operation sequence, critical approach and method of operation, estimation of time and quality or materials to be needed.
16. Revision and Test.

B- WORKSHOP SCIENCE & CALCULATION:

Note:

The syllabus in the subject of "Workshop Science & Calculation" for the first two years under ATS would be identical to that of 2 years under CTS and would remain unchanged.

WORKSHOP SCIENCE

1. Revision of the previous years syllabus with some practical problems related to trade.

2. Brief description of the manufacturing process of steel, copper, aluminum, cast iron and pig iron.
3. Applied problems on work-energy-power, I.H.P.B.H.P. efficiency.
4. Torque-simple problems centripetal force and centrifugal reaction.
5. Friction-Limiting friction-laws of friction-co-efficient of friction and angle of friction-friction on inclined plane-simple problems, sliding friction and rolling friction.
6. General condition of equilibrium of a service of forces acting on a body.
7. Examples on simply supported and load beams.
8. Revision.

WORKSHOP CALCULATION:

1. Revision of previous years syllabus with practical problems related to trade.
2. Surface speed- drilling, turning.
3. Calculation of machining time for drilling, turning, milling, shaping, grinding.
4. Feed, depth of cut and volume of metal removed in turning, drilling and milling.
5. Simple gear calculation-gear ratios, calculation on spur gear, transmission of power by belt.
6. Revision.

B- ENGINEERING DRAWING:

Note:

(The syllabus or the course outline in the subject of "Engg. Drg." for the first two years training under ATS training programme would be identical to the training or 2 years under CTS for a possible working period of 180 Hrs. and would remain unchanged).

1. Review and revise the first two years course contents with relation to the need of the establishment.
2. Sketches of orthographic/isometric/oblique view with dimensions, section and symbols for the given object/parts/components e.g., machined blocks involving with various operations, a machined block for, bearing housing, brackets, angle plate, Vee-blocks, single points tool etc.
3. Sketches of the joints of screwed members, locking devices for screw threads, shaft coupling using bolts nuts, keys, cotter joint between shaft and sleeve.
4. Standard welding symbols as per ISI and their application on drawing of a welded fabrication.
5. System of the application of limits and fits, tolerance machining symbols, geometrical tolerance on drawing-simple working drawing of trade related exercises using limits, fits,. Tolerance machining symbol etc. e.g., simple fitting, ground stepped shafts and blocks etc.
6. Assembly and detail drawing of trade related machine parts/tools e.g., clapper box, tailstock, bench vice,. Simple drill jig etc.
7. Advance blue print reading relating top missing limit size, fits, tolerance, M/C symbols, reading out of detail part drawing from an assembly and such other related problems from assembly drawing for operational analysis.
8. Solution of NCVT test papers.
9. Revision

D- SOCIAL STUDIES:

The syllabus has already been approved and is same for all the trades.

2. Brief description of the manufacturing process of steel, copper, aluminum, cast iron and pig iron.
3. Applied problems on work-energy-power, I.H.P.B.H.P. efficiency.
4. Torque-simple problems centripetal force and centrifugal reaction.
5. Friction-Limiting friction-laws of friction-co-efficient of friction and angle of friction-friction on inclined plane-simple problems, sliding friction and rolling friction.
6. General condition of equilibrium of a service of forces acting on a body.
7. Examples on simply supported and load beams.
8. Revision.

WORKSHOP CALCULATION:

1. Revision of previous years syllabus with practical problems related to trade.
2. Surface speed- drilling, turning.
3. Calculation of machining time for drilling, turning, milling, shaping, grinding.
4. Feed, depth of cut and volume of metal removed in turning, drilling and milling.
5. Simple gear calculation-gear ratios , calculation on sour gear, transmission of power by belt.
6. Revision.

B- ENGINEERING DRAWING:

Note:

(The syllabus or the course outline in the subject of "Engg. Drg." for the first two years training under ATS training programme would be identical to the training or 2 years under CTS for a possible working period of 180 Hrs. and would remain unchanged).

1. Review and revise the first two years course contents with relation to the need of the establishment.
2. Sketches of orthographic/isometric/oblique view with dimensions, section and symbols for the given object/parts/components e.g., machined blocks involving with various operations, a machined block for, bearing housing, brackets, angle plate, Vee-blocks, single points tool etc.
3. Sketches of the joints of screwed members, locking devices for screw threads, shaft coupling using bolts nuts, keys, cotter joint between shaft and sleeve.
4. Standard welding symbols as per ISI and their application on drawing of a welded fabrication.
5. System of the application of limits and fits, tolerance machining symbols, geometrical tolerance on drawing-simple working drawing of trade related exercises using limits, fits,. Tolerance machining symbol etc. e.g., simple fitting, ground stepped shafts and blocks etc.
6. Assembly and detail drawing of trade related machine parts/tools e.g., clapper box, tailstock, bench vice,. Simple drill jig etc.
7. Advance blue print reading relating top missing limit size, fits, tolerance, M/C symbols, reading out of detail part drawing from an assembly and such other related problems from assembly drawing for operational analysis.
8. Solution of NCVT test papers.
9. Revision

D- SOCIAL STUDIES:

The syllabus has already been approved and is same for all the trades.

APPRENTICESHIP TRAINING SCHEME

SYLLABUS - TURNER

PRACTICAL -44 WEEKS

<u>Week No.</u>	<u>Skill involved</u>
1.	Safety in shop floor
2 & 3	Forging practice-Cold chisels-Lathe carries-Lathe tools
4 & 5	Heat treatment of chisels-Lathe tools
6 & 7	Normalizing & annealing practice
8 & 9	Simple soldering practice
10	Brazing practice of H.S.S. & tungsten carbide tips on shank
11	Practice on shaping m/c.
12 & 13	Practice on milling m/c.
14 & 15	Practice on Horizontal boring m/c including threading
16	Use of boring bar-Spot facing operation etc.
17	Practice in parting off tubes in lathe
18	Use of jig & fixtures on lathe operation
19	Trepanning operation practice.
20	Different type of thread cutting practice . Test
21	Threaded taper plug (Fitting) practice
22	Use of cemented carbide tool having negative rake angles
23	Use of Machine chaser (tangential type) with die head
24	Use of taper turning attachment
25	Use of copying & relieving attachment (if facilities are available)
26	Use of gauges & templates
27	Use of Sine bar & slip gauge
28	Fitting practice - Combination of step- taper- thread-eccentrics.
29	Use of profile projector-tool maker microscope-for checking turned work pieces (if facilities available)
30	Use of bore dial gauge
31 & 32	Determination of exact machining allowance as per ISI norms for shop drawings of work pieces to be machined
33 & 34	Inspection of turned work pieces by measuring instruments gauges
35	Routine maintenance of machine
36	Checking of eccentricity
37 & 38	Setting & operation of Capstan lathe
39 & 40	Setting & operation of turret lathe
41 & 42	Use of gauges, jigs & fixtures etc. for production
43 & 44	Revision & Test

TRADE THEORY – 100 Hrs.

Sl. No.	Topics	Hrs.
1.	Safety	2
2.	Revision	3
3.	Brief description of common machine tools-shaper, slotter, miller, grinder etc.	
4.	Shop lay out-importance-principle of machine location-space-lighting-safety	5
5.	Brief description of special machine tools-Automatic lathe, Multi-spindle lathe-Crank turning lathe, roll turning lathe, relieving lathe etc.	1
6.	Machine ability of different materials-Mild steel, Cast Iron, Carbon Steel, aluminum, brass, bronze etc. Non-Metals-Plastic, rubber, fibre, etc.	5
7.	Importance of proper use of cutting fluids & lubricants-their properties & practical application.	5
8.	Heat treatment-Heat treatment of H.S.S.—furnace for hardening H.S.S. e.g. Muffle furnace-salt bath etc., cyaniding & nitrogen hardening, gas carbonizing process etc.	8
9.	Hydraulic & pneumatic mechanism in machine tools related to trade	5
10.	Routine maintenance of the machine tools related to trade	5
11.	Use of manufacturers catalogues, hand tools, tables & other data	5
12.	Surface finish- importance of quality finish of jobs-introduction of surface finish, BIS symbols for surface finish & their interpretation. Degree of accuracy possible with different types of lathe..	10
13.	Inspection-reduction of scrap by stage inspection-introduction to auto-inspection device, tool maker's microscope, optical projector.	8
14.	Modern development-description of programme control, Electric discharge machining (EDM), Electrochemical machining (ECM) methods etc	10
15.	Introduction to work simplification – Related to the trade job study-job analysis, job care, route care, planning of operation sequence, critical approach & method of operation, estimation of time & quality of materials to be needed.	10
16.	Revision & Test.	

WORKSHOP SCIENCE — 40 Hrs.

Sl. No.	Topics	Hrs.
1	Revision of the previous years syllabus with some practical problems related to trade.	3
2	Brief description of the manufacturing process of steel, copper, aluminum, cast iron & pig iron.	4
3	Applied problems on work- energy, power, I.H.P.,B.H.P.,efficiency	5
4	Torque –Simple problems- Centripetal force & centrifugal force.	5
5	Friction – Limiting friction- laws of friction- co-efficient of friction & angle of friction- friction of inclined plane – simple problem. Sliding friction & rolling friction	6
6	General condition of equilibrium of a service of forces acting on a body	4
7	Examples on simply supported load beams	4
8	Solution of NCVT Test Papers	5
9	Revision.	4

WORKSHOP CALCULATION -- 35 Hrs.

Sl. No.	Topics	Hrs.
1	Revision of previous years syllabus with practical problems related to trade	4
2	Surface speed- drilling, turning.	4
3	Calculation of machining time for drilling-turning-milling-shaping-grinding	5
4	Feed- depth of cut & volume of metal removed in turning- drilling & milling	5
5	Simple gear calculation- gear ratios- calculation for spur gear-transmission of power by belt.	6
6	Solution of NCVT test papers.	6
7	Revision	5

ENGINEERING DRAWING -- 85 Hrs.

Sl. No.	Topics	Hrs.
1	Review & revision of two yrs. course contents with relation to the need of the establishments.	8
2	Sketches of orthographic , isometric, oblique view with dimensions. Section & symbols of the given object / parts / components e.g. machined block for bearing housing; a machined block involving various operations, brackets, angle plates, Vee-block, single point tool etc	13
3	Sketches of the joint of screw members, locking devices for screw threads, shaft coupling using bolts, nuts, keys, cotter joint between shaft & sleeve	12
4	Standard welding symbols as per BIS & their application on drawing of a welded fabrication	5
5	System of application of limit & fits, tolerance, machining symbols, geometrical tolerance on drawings – Simple working devices of trade related exercises using limit, fits & tolerance, machining symbols etc. e.g. Simple fitting, ground stepped shafts & blocks etc.	12
6	Assembly & detail drawing of trade related machine parts e.g. clapper box, tailstock, bench vice, simple drill jig etc.	10
7	Advance blue print reading relating to missing limit sign, fits, tolerance, machining symbols, reading out of detail part drawing from an assembly & such other related problems from assembly drawing for operation analysis.	10
8	Solution of NCVT Test Papers	10
9	Revision	5

SOCIAL STUDIES -- 20 Hrs. --- Same syllabus for all trades